

# M Series Manual Handwheel Gear Actuator

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## Introduction

### Scope of Manual

This instruction manual includes installation, operation, maintenance, and parts ordering information for M Series manual handwheel gear actuators. Refer to separate manuals for instructions covering the valves used with these actuators.

Do not install, operate, or maintain an M Series handwheel gear actuator without first • being fully trained and qualified in valve, actuator, and accessory installation, operation, and maintenance, and • carefully reading and understanding the contents of this manual. If you have any questions about these instructions, contact your Emerson Process Management™ sales office before proceeding.

### Description

M Series handwheel gear actuators (figure 1) are totally enclosed, weatherproof, worm gear actuators for reliable manual operation with Type A11, A31A and A41 High Performance Butterfly Valves. The M actuator consists of a body housing, cover, worm gear, input shaft, and handwheel. The housing is grease packed.



W4715-1 / IL

Figure 1. M Series Handwheel Gear Actuator

## Specifications

Specifications for the M Series manual handwheel gear actuators are shown in table 1.

### Note

**Neither Emerson, Emerson Process Management, nor any of their affiliated entities assumes responsibility for the selection, use and maintenance of any product. Responsibility for the selection, use, and maintenance of any product remains with the purchaser and end-user.**



Table 1. Specifications

<b>Actuator Sizes</b> <p>See tables 2, 3 and 4</p> <b>Valve Compatibility</b> <ul style="list-style-type: none"> <li>■ Accepts Type A11 valve square-end shafts from 10.3 to 34.9 mm (13/32 to 1-3/8 inches), keyed shafts from 38.1 to 44.5 mm (1-1/2 to 1-3/4 inches)<sup>(1)</sup></li> <li>■ Accepts Type A31A valve keyed shafts from 44.5 to 57.2 mm (1-3/4 to 2-1/4 inches)</li> <li>■ Accepts Type A41 valve Double D shafts from 12.7 to 44.5 mm (1/2 to 1-3/4 inches)</li> </ul> <b>Maximum Torque Output</b> <p>See Bulletin 22.2:M</p> <b>Handwheel Rotation</b> <p>Clockwise handwheel rotation closes the valve (produces clockwise rotation of the valve shaft)</p>	<b>Construction Materials</b> <p><b>Housing and Cover:</b> Cast iron</p> <p><b>Worm:</b> Steel</p> <p><b>Worm Gear:</b> Manganese Bronze</p> <p><b>Input Shaft:</b> Steel (303 SST on request)</p> <p><b>Handwheel:</b> Cast Iron</p> <b>Mounting Positions</b> <p>See figure 2</p> <b>Dimensions and Approximate Weights</b> <p>See Bulletin 22.2:M</p> <b>Options</b> <ul style="list-style-type: none"> <li>■ Locking plates with padlock for fixed positioning</li> <li>■ Stops are typically set every 10°, but can be special ordered with stops set up to 45° from both ends</li> <li>■ Handwheel extensions</li> </ul>
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1. As an option, CL600 NPS 10 (with 1-1/2 inch keyed shaft) and NPS 12 (with 1-3/4 inch shaft) Type A11 valves require a keyed connection if being used with size 9KE or 10KE-6 actuators.

## Installation



### WARNING

**To avoid personal injury or property damage resulting from the sudden release of pressure, do not install the actuator where service conditions could exceed the limits given in this manual or on the appropriate nameplates. Use pressure-relieving devices as required by government or accepted industry codes and good engineering practices.**

**Always wear protective gloves, clothing, and eyewear when performing any installation operations to avoid personal injury.**

**Check with your process or safety engineer for any additional measures**

**that must be taken to protect against process media.**

**If installing into an existing application, also refer to the WARNING at the beginning of the Maintenance section in this instruction manual.**

The M Series gear actuator is normally mounted on a valve at the factory. However, the actuator can be field mounted; it can be mounted in any position on the Type A11 or A31A and it can be mounted in positions 1 and 3 on the Type A41, as shown in figure 2. Make clearance considerations before mounting the actuator to determine the most suitable mounting position.

The M Series actuator has a direct stab-on design. Simply insert the valve shaft into the broached area of the body housing. Then attach the mounting bracket to the actuator, using the torques listed in table 5, and attach the mounting bracket to the valve.

# Instruction Manual

Form 5454

November 2007

# M Series Actuator

Table 2. M Series Gear Actuator for A11 (CL600)

VALVE SIZE, NPS	VALVE SHAFT SIZE, INCHES	MAXIMUM RECOMMENDED TORQUE <sup>(1)</sup>		ACTUATOR SIZE	HANDWHEEL DIAMETER, INCHES	RIM FORCE <sup>(2)</sup>		NUMBER OF TURNS TO CLOSE <sup>(3)</sup>	MAXIMUM TORQUE RATING OF ACTUATOR	
		n•m	lb•in			n	lb		N•m	Lbf•in
3	13/32	113	1,000 <sup>(4)</sup>	1KE	12	80	18	9.5	452	4,000
4	5/8	303	2,690 <sup>(4)</sup>	1KE	12	209	47	9.5	452	4,000
6	7/8	643	5,700	2KE	12	445	100	9.5	678	6,000
		765	6,780 <sup>(4)</sup>	5KE		400	90	12.5	904	8,000
8	1	643	5,700	2KE	12	445	100	9.5	678	6,000
		846	7,500	5KE	12	445	100	12.5	904	8,000
		1349	11,960 <sup>(4)</sup>	7KE	18	436	98	13.5	2,260	20,000
10	1-3/8	1354	12,000	7KE	18	440	99	13.5	2,260	20,000
	1-1/2	2144	19,000	9KE	24	440	99	16	3,390	30,000
	1-1/2	3520	31,160 <sup>(4)</sup>	10KE-6	18	214	48	72	8,474	75,000
12	1-3/8	1354	12,000	7KE	18	440	99	13.5	2,260	20,000
	1-3/4	2144	19,000	9KE	24	440	99	16	3,390	30,000
	1-3/4	3520	31,160 <sup>(4)</sup>	10KE-6	18	214	48	72	8,474	75,000

1. Maximum recommended torque for the valve/actuator combination is based on valve shaft rating, actuator rating and rim force.

2. Rim force required to produce Maximum recommended torque.

3. This column shows the number of times the handwheel must be turned to close the valve 90 degrees.

4. Shaft rating of the A11 valve.

Table 3. M Series Gear Actuator for A31A

VALVE SIZE, NPS	VALVE SHAFT SIZE, INCHES	MAXIMUM RECOMMENDED TORQUE <sup>(1)</sup>		ACTUATOR SIZE	HANDWHEEL DIAMETER, INCHES	RIM FORCE <sup>(2)</sup>		NUMBER OF TURNS TO CLOSE <sup>(3)</sup>	MAXIMUM TORQUE RATING OF ACTUATOR	
		n•m	lb•in			n	lb		N•m	Lbf•in
CL150										
14	1-3/16	644	5,700	2KE	12	445	100	9.5	271	6,000
		847	7,500	5KE	12	445	100	12.5	904	8,000
		1287	11,390 <sup>(4)</sup>	7KE	18	418	94	13.5	2,260	20,000
16	1-1/4	644	5,700	2KE	12	445	100	9.5	271	6,000
		847	7,500	5KE	12	445	100	12.5	904	8,000
		1,579	13,970 <sup>(4)</sup>	7KE	18	512	115	13.5	2,260	20,000
18	1-1/2	1356	12,000	7KE	18	440	99	13.5	2,260	20,000
		2188	19,370 <sup>(4)</sup>	9KE	24	449	101	16	3,390	30,000
		2188	19,370	10KE-6	18	133	30	72	8,474	75,000
20	1-3/4	1356	12,000	7KE	18	440	99	13.5	2,260	20,000
		2147	19,000	9KE	24	440	99	16	3,390	30,000
		2555	22,620 <sup>(4)</sup>	10KE-6	18	156	35	72	8,474	75,000
24	2-1/4	2147	19,000	9KE	24	440	99	16	3,390	30,000
		8,474	75,000	10KE-6	18	516	116	72	8,474	75,000
CL300										
14	1-3/4	1356	12,000	7KE	18	440	99	13.5	2,260	20,000
		2555	22,620 <sup>(4)</sup>	9KE	24	525	118	16	3,390	30,000
16	1-3/4	1356	12,000	7KE	18	440	99	13.5	2,260	20,000
		2555	22,620 <sup>(4)</sup>	9KE	24	525	118	16	3,390	30,000
18	2-1/4	2147	19,000	9KE	24	440	99	16	3,390	30,000
		6,985	61,830 <sup>(4)</sup>	10KE-6	18	423	95	72	8,474	75,000
20	2-3/4	2147	19,000	9KE	24	440	99	16	3,390	30,000
		8474	75,000	10KE-6	18	516	116	72	8,474	75,000
24	2-3/4	8474	75,000	10KE-6	18	516	116	72	8,474	75,000

1. Maximum recommended torque for the valve/actuator combination is based on valve shaft rating, actuator rating and rim force.

2. Rim force required to produce Maximum recommended torque.

3. This column shows the number of times the handwheel must be turned to close the valve 90 degrees.

4. Shaft rating of the A31A valve.

Table 4. M Series Gear Actuator for A41

VALVE SHAFT SIZE, INCHES	ACTUATOR SIZE	SHAFT RATING		HANDWHEEL DIAMETER, INCHES	RIM FORCE <sup>(1)</sup>		NUMBER OF TURNS TO CLOSE <sup>(2)</sup>	MAXIMUM TORQUE RATING OF ACTUATOR	
		n•m	lb•in		n	lb		N•m	Lbf•in
1/2	0KE/D1	58	515	8	441	21	6	271	2,400
5/8	0KE/D2	138	1,230	8	227	51			
3/4	0KE/D3	240	2,120	8	391	88			
1	2KE/D4	468	4,140	12	325	73	9.5	678	6,000
1-1/4	6KE/D5	1,110	9,820	24	365	82	10	1,356	12,000
1-1/2	6KE/D6	1,356	12,000	24	445	100			
1-3/4	9KE/D7	2,658	23,520	36	365	82	16	3,390	30,000

1. Rim force required to produce shaft rating torque.

2. This column shows the number of times the handwheel must be turned to close the valve 90 degrees.

Table 5. M Series Mounting Plate to Gearbox

Type M Actuator	Bolt Size	Bolt Torque n•m	Bolt Torque lb•f
A11 and A31A Compatible			
1KE	1/2	91	67
2KE	1/2	91	67
5KE	1/2	91	67
7KE	5/8	163	120
9KE	5/8	163	120
10KE-6	5/8	163	120
A41 Compatible			
0KE/D1	5/16	22	16.5
0KE/D2	5/16	22	16.5
0KE/D3	5/16	22	16.5
2KE/D4	3/8	39	29
6KE/D5	3/8	39	29
6KE/D6	5/8	163	120
9KE/D7	3/4	258	190

## Operation

After the actuator and control valve assembly are installed, the manual actuator is ready for operation.

### CAUTION

Applying too much torque to the actuator and valve parts could cause damage to the parts. To avoid such damage, do not exceed the rim force listed in table 2, 3 and 4 or any other torque limitation of internal valve parts. Also, do not use wrenches or other devices on the handwheel or handwheel shaft to increase operating force.

## Maintenance

### WARNING

Avoid personal injury from sudden release of process pressure. Before performing any maintenance operations:

- Always wear protective gloves, clothing, and eyewear when performing any maintenance operations to avoid personal injury.
- Disconnect any operating lines providing air pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve.
- Use bypass valves or completely shut off the process to isolate the

**valve from process pressure. Relieve process pressure on both sides of the valve. Drain the process media from both sides of the valve.**

- **Vent the power actuator loading pressure and relieve any actuator spring precompression.**

- **Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.**

- **The valve packing box may contain process fluids that are pressurized, *even when the valve has been removed from the pipeline.* Process fluids may spray out under pressure when removing the packing hardware or packing rings, or when loosening the packing box pipe plug.**

- **Check with your process or safety engineer for any additional measures that must be taken to protect against process media.**

If the rim force required to rotate the handwheel exceeds the rim force listed in table 2, 3, or 4, check for the following conditions:

- Insufficient lubrication
- Seized actuator parts
- Excessive pressure drop across the valve
- Obstruction to the valve disc rotation

If the manual actuator does not seem to control the process fluid, the worm or drive sleeve gear teeth may be broken, the handwheel pin may be sheared, or the valve parts may be broken. Purchase a replacement manual actuator if necessary. Refer to the valve instruction manual if valve maintenance is needed.

## Lubrication

The interior parts of the M Series actuator should be lubricated on a regular schedule with a quality gear lubricant. The interior parts should also be lubricated whenever difficulty in handwheel rotation indicates a need for lubrication.

1. Isolate the control valve from the line pressure, release pressure from both sides of the valve body, and drain the process media from both sides of the valve.

2. Remove the cap screws that secure the gearbox cover plate and remove the gearbox cover plate.

3. Coat the worm, the drive sleeve gear teeth, and the bearing surfaces of the gearbox housing and worm with a quality gear lubricant.

4. Replace the cover plate and cap screws using the bolt torques listed in table 5.

5. Replace the manual actuator on the valve. Adjust the actuator travel stop to limit the open and closed positions of the valve disc following the steps in the appropriate valve instruction manual.

## Parts Ordering

When corresponding with your Emerson Process Management sales office, indicate the size of the M Series actuator. The size is stamped on the gearbox. You should also provide the serial number of the valve.

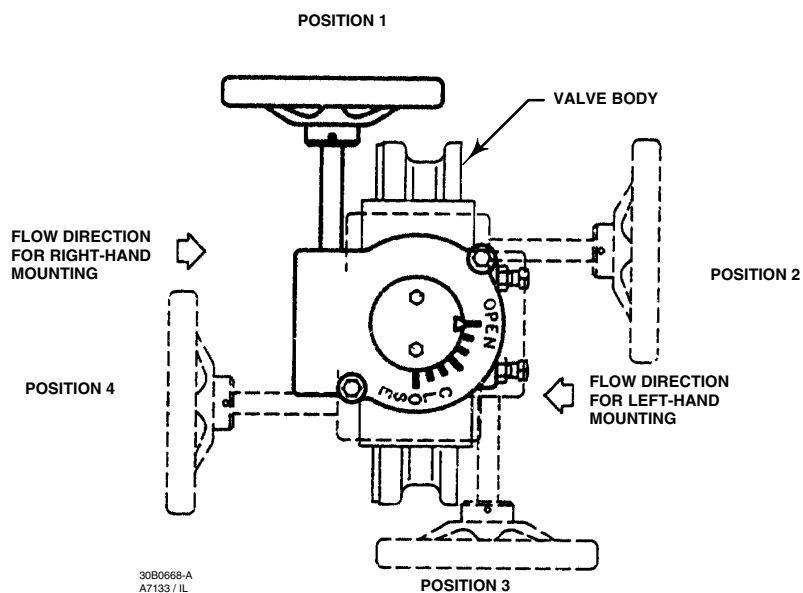


### WARNING

**Use only genuine Fisher® replacement parts. Components that are not supplied by Emerson Process Management should not, under any circumstances, be used in any Fisher valve, because they will void your warranty, might adversely affect the performance of the valve, and could give rise to personal injury and property damage.**

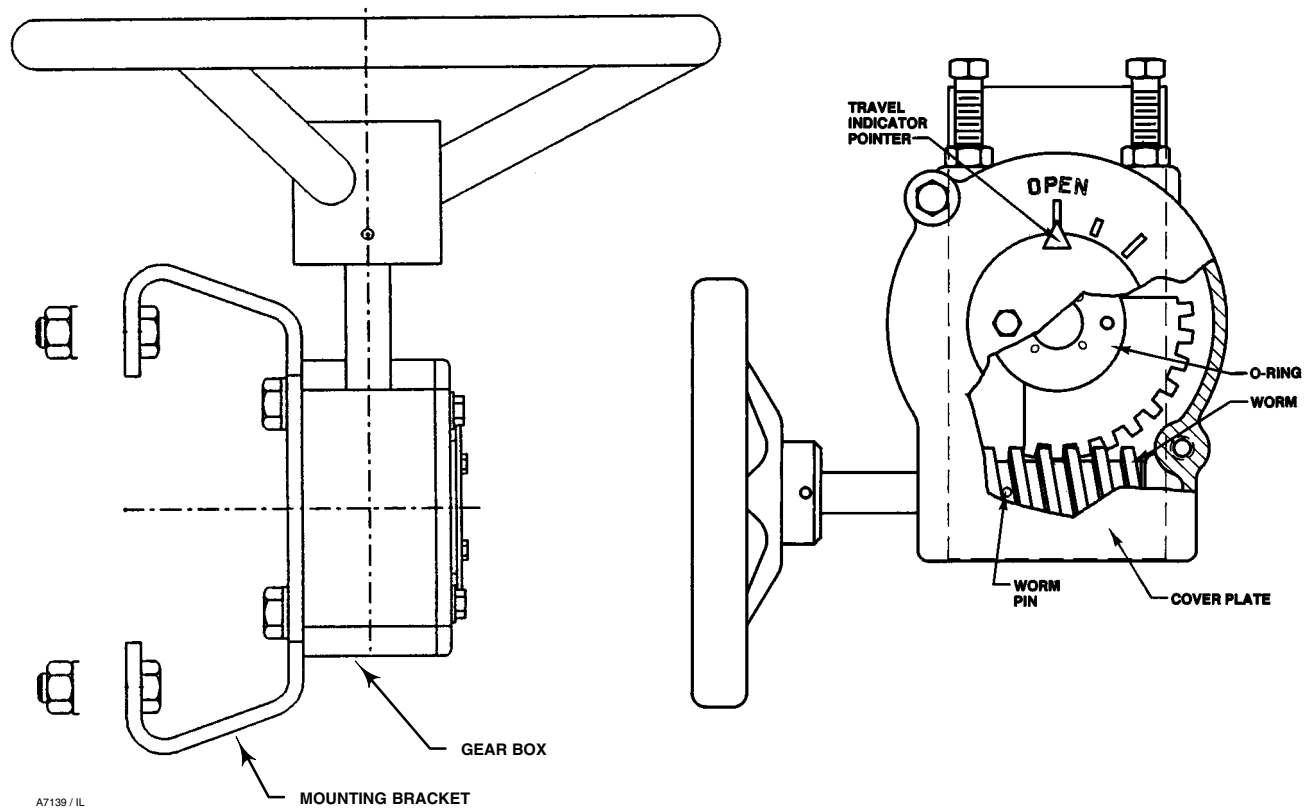
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**NOTE:**  
ONLY POSITIONS 1 AND 3 ARE APPLICABLE TO TYPE A41.

*Figure 2. Available Mounting Positions*



*Figure 3. Typical M Series Assembly*

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